Summary of Stream Inventories on the National Forests in Alabama, 2018

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2018 Inventory Summary

The National Forests in Alabama (NFAL) partnered with the USDA Forest Service, Southern Research Station, Center for Aquatic Technology Transfer (CATT) to inventory stream habitat and fish from June 25th to 30th, 2018. The data collected will be used by NFAL to examine for trends in stream condition and to assess impacts of land management practices on stream health.

Site Selection

John Moran (Forest Fisheries Biologist) selected stream sample sites on national forest land according to the NFAL aquatic monitoring plan (Figure 1; Appendix A). The CATT inventoried 9 sites located on 5 districts.

Field Methods

A two-person team collected stream habitat data using methods described in the NFAL aquatic monitoring plan (Appendix A). A fish sampling team of 5 – 7 persons used a backpack electrofisher and siene to sample fish using the 30+2 Index of Biotic Integrity (IBI) method described in the NFAL aquatic monitoring plan (Appendix A).

Data Availability

The 2018 stream inventory data reside in a MS Access database that has been provided to John Moran, National Forests in Alabama. The CATT retained a backup copy of the database. The database stores habitat and fish information for 9 sample sites located on 5 districts. Habitat data include sample site coordinates, photos, bankfull width, water temperature, habitat areas, large wood counts, substrate relative abundances, and vegetation coverage (Appendix B). Fish data include species counts for adult and young-of-year (Appendix B).

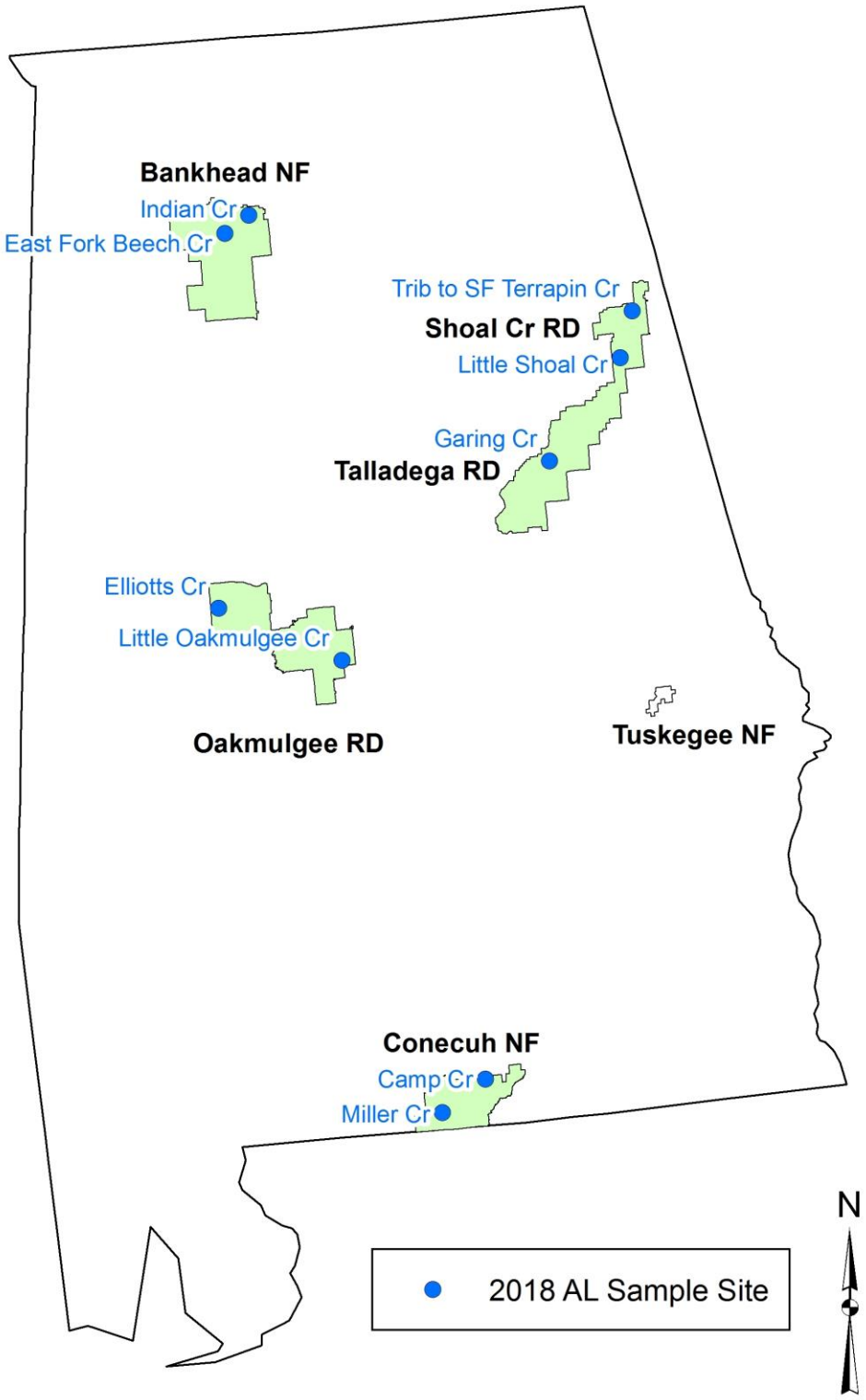


Figure 1. 2018 stream sample sites on the National Forests in Alabama.

Appendix A: Field Methods

National Forests in Alabama Aquatic Monitoring Plan - Revised

Prepared by: John D. Moran, Forest Fisheries Biologist

2015

Introduction

This is a revised version of the monitoring plan developed in 2008. The purpose of this monitoring plan is to provide the National Forests in Alabama a standard, scientifically rigorous, and cost effective tool to assess and monitor the effects of Forest Plan implementation on aquatic habitat and fauna. Monitoring and evaluation provide information to determine whether programs and projects are meeting Forest Plan direction and measuring management effectiveness and progress toward achieving or maintaining the plan's desired conditions or objectives. This monitoring plan complies with CFR 219.9 and 219.12. A separate monitoring plan was developed to inventory and monitor mussel populations.

Wadeable streams will be sampled for fish using the 30 + 2 Index of Biotic Integrity (IBI) technique developed by the Geological Survey of Alabama (GSA). This IBI protocol was specifically calibrated for the ichthyoregions of Alabama (Figure 1) [1] and enables comparisons of biological conditions between similar stream reaches. This protocol is the standard used extensively across Alabama to measure stream health by state resource agencies including the GSA, Alabama Department of Environmental Management (ADEM), and Wildlife and Freshwater Fisheries Department (WFFD). The adoption of this standardized biomonitoirng tool allows the National Forests in Alabama to assess the overall biological condition of a stream using fish community metrics. The advantages of using the fish community over other aquatic groups to assess the biological condition of a stream include: fishes occupy the full range of positions throughout the food chain, fishes are generally present in all waters, population number of fishes are relatively more stable over longer periods of time, and environmental requirements of fishes are well known.

At sites selected for an IBI assessment, physical stream habitat attributes will be measured as part of the effort to describe the biological condition of the stream. These attributes include habitat type and quantity, substrate type and composition, and the classification and inventory of in-channel large woody debris within the designated reach of stream.

Methods

Sample Sites – Sites within wadeable sections of perennial streams on National Forests in Alabama were randomly selected using methods described in the 2008 monitoring plan. To ensure the presence of a diverse fish community, only streams classified as perennial will be sampled. Ten sites per year will be sampled for 3 consecutive years within a 10 year period. Permanent sampling sites will be selected from the random sites and sites surveyed previously by state agencies to be systematically resampled over time.

30 + 2 IBI – This sampling method employs a small-mesh seine net and a backpack electrofisher used in tandem or separately. A 10' or 15' seine net will be used dependent on size of stream. 10 sampling efforts are allocated each to riffle, run, and pool habitat. Each effort consists of sampling an area the size equaling the length of the seine net times itself (10'X10' or 15'X15') with one of the following methods:

1) In faster flowing water, the seine net is set at the downstream end of the sample area. Without disturbing the area to be sampled (directly in front of the net within its width), start upstream from the net at a distance equal to the length of the net (10' or 15') and shock towards the seine disturbing the bottom. Stunned fish in the water column will wash into the net while benthic fishes will be dislodged from bottom by kicking the substrate.
2) In slower flowing water, pull the seine net downstream the distance equal to the length of the net by itself or following the backpack electrofisher.
3) In still or slow flowing water, block the downstream end of the sample area and pass through the sample area with electrofisher and dipnetter to collect fish.

A minimum of 30 efforts will completes that portion of the sampling and for those sites with missing or reduced habitat components, the effort will be proportioned to the habitat present. The 30 + 2 method prescribes 2 additional sampling efforts along shorelines. The shoreline sampling consists of an electrofisher and dipnetter working in an upstream direction along a continuous shoreline reach of 150 feet. The collections from each of the 30 efforts and from the 2 shoreline efforts will be combined to equal one sample for a site.

Habitat – The physical stream habitat within the entire area sampled for fish will be evaluated. The reach will be portioned into consecutive discrete habitat units based on stream characteristics (Table 1). The length of each habitat unit will be measured and average width will be visually estimated. Within each habitat unit the substrate size and composition will be estimated using categories described in Table 2, large woody debris will be classified and inventoried using attributes described in Table 3, and notable features will be recorded using descriptions in Table 4. Relative abundance of substrate type will be recorded for the most predominant substrates present to total 100 percent within each habitat unit. For example, a habitat unit might contain 50% cobble, 30% small gravel, and 20% sand. If rooted aquatic vegetation is present, the percent of the surface area of the habitat unit the vegetation occupies will be recorded.

Data Interpretation – The IBI was calibrated to each of the 5 separate ichthyoregions delineated within Alabama (Figure 1). A set of fish community metrics, selected for each ichthyoregion, were scored and compared to values expected from an undisturbed fish community in similar-sized streams of the same ichthyoregion. The sum of scores of each metric represents the final IBI score for a site. Fish communities are assigned to one of five classes based on the final IBI score: excellent, good, fair, poor, and very poor (Table 5). A 'no fish' class is used when repeated sampling fails to produce any fish. Detailed scoring procedures are outlined in documents describing the development of IBIs for each ichthyoregion [2, 3, 4, 5]. Comparing reach-wide fish community conditions over time will provide indicators to detect changes in the streams health.

Table 1. Habitat type definitions and descriptions.

Riffle - Fast water, turbulent, gradient <12%; shallow reaches characterized by water flowing over or around rough bed materials that break the surface during low flows; also include rapids (turbulent with intermittent whitewater, breaking waves, and exposed boulders), chutes (rapidly flowing water within narrow, steep slots of bedrock), and sheets (shallow water flowing over bedrock) if gradient <12%.

Cascade – Fast water, turbulent, gradient ≥ 12%; highly turbulent series of short falls and small scour basins, with very rapid water movement; also includes sheets (shallow water flowing over bedrock) and chutes (rapidly flowing water within narrow, steep slots of bedrock) if gradient ≥ 12%.

Run - Fast water, non-turbulent, gradient <12%; deeper than riffles with little or no surface agitation or flow obstructions and a flat bottom profile.

Pool - Slow water, surface turbulence may or may not be present, gradient <1%; generally deeper and wider than habitat immediately upstream and downstream, concave bottom profile; includes dammed pools, scour pools, and plunge pools.

Glide - Slow water, no surface turbulence, gradient <1%; shallow with flat bottom profile.

Table 2. Size classes and descriptions of substrate particles.

Size Class	Size (mm)	Descriptions
Organic	--	Dead organic matter, leaves, detritus, etc.
Clay	< 0.00024	Sticky fine sediment
Silt	0.00024 – 0.0039	Slippery fine sediment
Sand	.0039 – 2.0	Gritty fine sediment
Small Gravel	2.1 – 16.0	Sand to thumbnail size
Large Gravel	16.1 – 64.0	Thumbnail to fist size
Cobble	64.1 – 256.0	Fist to head size
Boulder	> 256.0	Larger than head size
Bedrock	--	Solid parent material

Table 3. . Size classes and descriptions used to categorize large woody debris (LWD). The definition of LWD is dead and down wood within the bankfull channel at least 1m in length and > 10 cm in diameter.

Category	Length (m)	Diameter (cm)	Description
1	1-5	10-55	Short, skinny
2	1-5	>55	Short, fat
3	>5	10-55	Long, skinny
4	>5	>55	Long, fat
Rootwad	--	--	Roots on dead and down tree

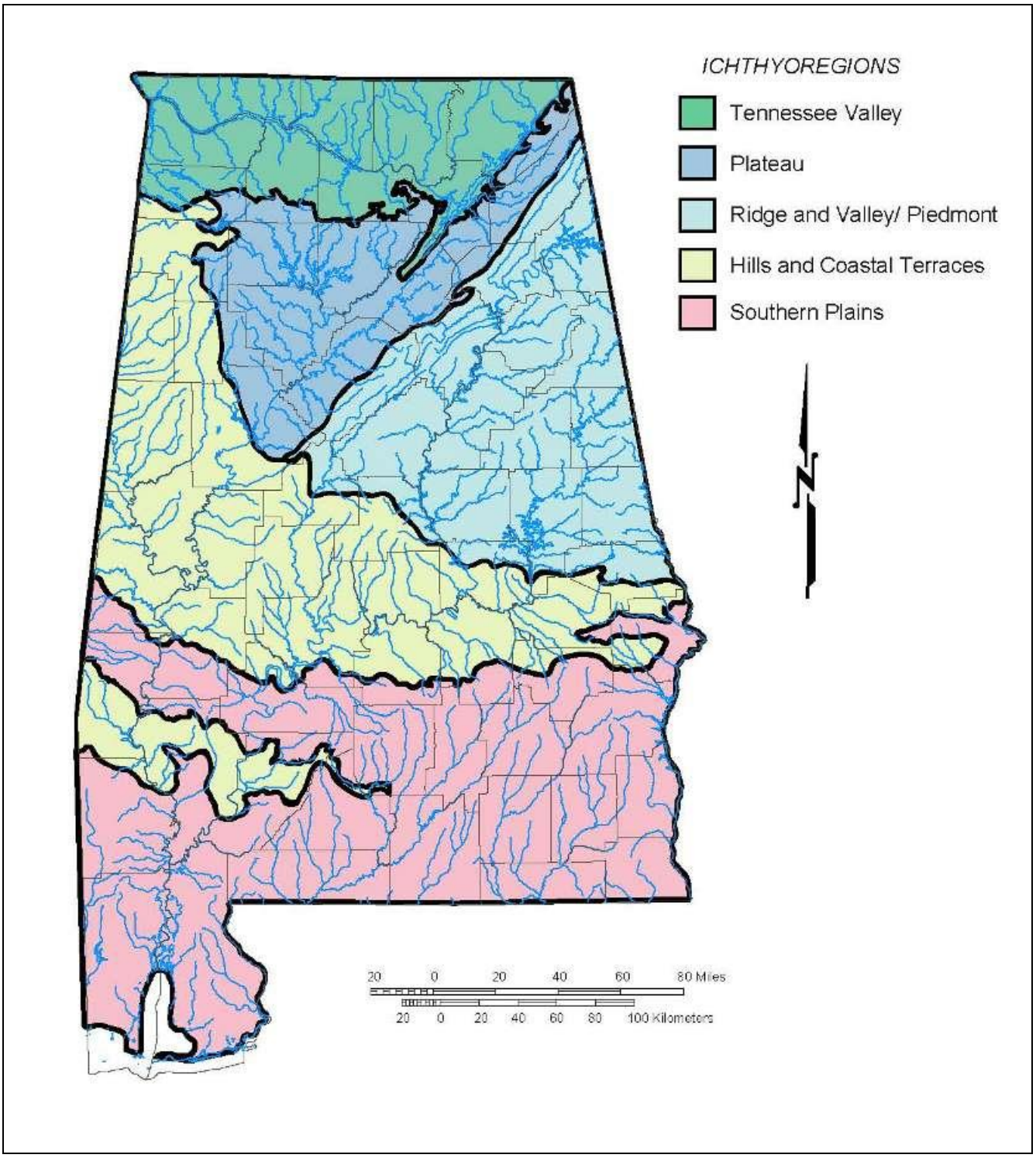
Table 4. List and descriptions of feature types. A feature can be manmade or natural and could describe an important landmark or characteristic that could affect physical stream habitat.

Feature	Description
Natural Migration Barrier	Waterfall, cascade, head-cut, debris jam, or other natural feature that prevents the upstream migration of aquatic organisms
Tributary	Perennial, intermittent, or ephemeral channel entering the mainstem being surveyed
Beaver Dam and/or activity	Active or old beaver dam, bank excavation, fresh beaver cuttings, droppings, etc.
Spring	In channel or adjacent to channel spring with significant water input to the mainstem channel
Landslide	Substantial erosion of the bank and deposition of riparian material outside of normal bank cutting
Trail – crossing or adjacent to stream	System or illegal trail crossing or adjacent to stream channel. Hiking, horse, OHV, or combination. Record condition and impacts to stream habitat
Road – crossing or adjacent to stream	System or illegal road crossing or adjacent to stream channel. Record type: bridge, ford, culvert, etc. and impacts to stream habitat
Other	Any other feature that could potentially have an effect on physical stream habitat

Table 5. Narrative class score and attributes of those classes. From O'Neal and Shepard, 1998 [6].

Class	Attributes
Excellent	Comparable to the best situations without human disturbance, all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with a full array of age (size) classes; balanced trophic structure.
Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species are present with less than optimal abundances or size distributions; trophic structure shows some signs of stress.
Fair	Signs of additional deterioration include loss of intolerant forms, fewer species, and highly skewed trophic structure.
Poor	Dominated by omnivores, tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present.
Very Poor	Few fish present, mostly introduced or tolerant forms; hybrids common.
No Fish	Repeated sampling yields no fish

Figure 1. Map of Alabama ichthyoregions from GSA Open-file report [1].



References

[1] O'Neal, P.E. and T.E. Shepard. 2007. Delineation of Ichthyoregions in Alabama for Use with the Index of Biotic Integrity, Open-File Report 0711. Geological Survey of Alabama, Water Investigations Program. Tuscaloosa, AL.

[2] O'Neal, P.E. and T.E. Shepard. 2011. Calibration of the Index of Biotic Integrity for the Hills and Coastal Terraces Ichthyoregion in Alabama. Open-file Report 1116. Geological Survey of Alabama, Ecosystems Investigations Program. Tuscaloosa, AL.

[3] O'Neal, P.E. and T.E. Shepard. 2011. Calibration of the Index of Biotic Integrity for the Plateau Ichthyoregion in Alabama. Open-file Report 1111. Geological Survey of Alabama, Ecosystems Investigations Program. Tuscaloosa, AL.

[4] O'Neal, P.E. and T.E. Shepard. 2011. Calibration of the Index of Biotic Integrity for the Ridge and Valley Ichthyoregion in Alabama. Open-file Report 1109. Geological Survey of Alabama, Ecosystems Investigations Program. Tuscaloosa, AL.

[5] O'Neal, P.E. and T.E. Shepard. 2012. Calibration of the Index of Biotic Integrity for the Southern Plains Ichthyoregion in Alabama. Open-file Report 1210. Geological Survey of Alabama, Ecosystems Investigations Program. Tuscaloosa, AL.

[6] O'Neal, P.E. and T.E. Shepard. 1998. Standard Operating Procedure Manual for Sampling Freshwater Fish communities and Application of the Index of Biotic Integrity for Assessing Biological Condition of Flowing, Wadeable Streams in Alabama. Environmental Geology Division, Tuscaloosa, Alabama.

Appendix B: Data Summary

Table 1. Sample reach start and end coordinates.

District	Stream	Sample Date	Sample Reach Coordinates (WGS84)			
			Downstream Reach Start		Upstream Reach End	
Bankhead	East Fork Beech Creek	6/27/2018	34.30500173	-87.30541896	34.30807642	-87.30588005
Bankhead	Indian Creek	6/27/2018	34.36356177	-87.19202279	34.36101991	-87.19405104
Conecuh	Camp Creek	6/25/2018	31.16436241	-86.53405605	31.16462699	-86.53533890
Conecuh	Miller Creek	6/25/2018	31.05913180	-86.73201063	31.05932120	-86.73360561
Oakmulgee	Elliotts Creek	6/26/2018	32.95651301	-87.48684919	32.95546029	-87.48513744
Oakmulgee	Little Oakmulgee Creek	6/26/2018	32.72701561	-86.97162443	32.72837161	-86.97071079
Shoal Creek	Little Shoal Creek	6/29/2018	33.71289713	-85.61803021	33.71025549	-85.61790364
Shoal Creek	Trib to SF Terrapin Cr	6/29/2018	33.87651938	-85.54361173	33.87589199	-85.54692493
Talladega	Garing Creek	6/30/2018	33.36877851	-85.97782819	33.36873685	-85.97459025

Table 2. Bankfull width and water temperature.

District	Stream	Bankfull Width (m)		Reach Water Temperature (C)
		Downstream Reach Start	Upstream Reach End	
Bankhead	East Fork Beech Creek	11	--	22
Bankhead	Indian Creek	8	7	24
Conecuh	Camp Creek	5	5	24
Conecuh	Miller Creek	6	5	23
Oakmulgee	Elliotts Creek	4	5	--
Oakmulgee	Little Oakmulgee Creek	5	4	21
Shoal Creek	Little Shoal Creek	12	14	23
Shoal Creek	Trib to SF Terrapin Cr	7	5	21
Talladega	Garing Creek	7	12	23

Table 3. Pool and riffle habitat area.

District	Stream	Pool Area (m^2)	Riffle Area (m^2)	Total Area (m^2)
Bankhead	East Fork Beech Creek	2,409	415	2,823
Bankhead	Indian Creek	1,249	509	1,758
Conecuh	Camp Creek	699	568	1,267
Conecuh	Miller Creek	1,186	165	1,350
Oakmulgee	Elliotts Creek	704	304	1,007
Oakmulgee	Little Oakmulgee Creek	289	411	700
Shoal Creek	Little Shoal Creek	1,803	878	2,681
Shoal Creek	Trib to SF Terrapin Cr	538	1,104	1,642
Talladega	Garing Creek	1,900	1,264	3,164

Table 4. Large wood per kilometer and counts.

		Large Wood per Km						Large Wood Count in Sample Reach						Inventory
District	Stream	LW1/ km	LW2/ km	LW3/ km	LW4/ km	RW/ km	Total LW/km	LW1 n	LW2 n	LW3 n	LW4 n	RW n	Total LW n	Distance (km)
Bankhead	East Fork Beech Creek	86	0	47	0	10	144	33	0	18	0	4	55	0.4
Bankhead	Indian Creek	138	0	25	3	3	168	55	0	10	1	1	67	0.4
Conecuh	Camp Creek	52	0	13	0	0	65	16	0	4	0	0	20	0.3
Conecuh	Miller Creek	412	0	98	0	0	510	122	0	29	0	0	151	0.3
Oakmulgee	Elliotts Creek	133	43	0	0	9	185	31	10	0	0	2	43	0.2
Oakmulgee	Little Oakmulgee Creek	253	4	54	0	4	315	61	1	13	0	1	76	0.2
Shoal Creek	Little Shoal Creek	239	0	22	0	12	274	96	0	9	0	5	110	0.4
Shoal Creek	Trib to SF Terrapin Cr	12	0	10	0	0	22	5	0	4	0	0	9	0.4
Talladega	Garing Creek	198	0	27	0	2	227	82	0	11	0	1	94	0.4

Table 5. Average percent substrate and vegetation in pools.

		Substrate Average Relative Abundance (%) in POOLS									
District	Stream	Organic	Clay	Silt	Sand	Small Gravel	Large Gravel	Cobble	Boulder	Bedrock	Aquatic Vegetation Coverage in POOLS (Avg. %)
Bankhead	East Fork Beech Creek	0%	0%	0%	35%	0%	2%	8%	18%	38%	0%
Bankhead	Indian Creek	13%	0%	9%	70%	0%	0%	0%	0%	8%	0%
Conecuh	Camp Creek	48%	0%	0%	52%	0%	0%	0%	0%	0%	0%
Conecuh	Miller Creek	80%	1%	0%	19%	0%	0%	0%	0%	0%	0%
Oakmulgee	Elliotts Creek	34%	0%	0%	66%	0%	0%	0%	0%	0%	0%
Oakmulgee	Little Oakmulgee Creek	13%	0%	0%	83%	3%	1%	0%	0%	0%	0%
Shoal Creek	Little Shoal Creek	11%	0%	7%	40%	24%	17%	0%	0%	0%	0%
Shoal Creek	Trib to SF Terrapin Cr	5%	0%	4%	5%	7%	12%	37%	12%	18%	1%
Talladega	Garing Creek	0%	3%	3%	29%	17%	19%	7%	9%	12%	3%

Table 6. Average percent substrate and vegetation in riffles.

		Substrate Average Relative Abundance (%) in RIFFLES									
District	Stream	Organic	Clay	Silt	Sand	Small Gravel	Large Gravel	Cobble	Boulder	Bedrock	Aquatic Vegetation Coverage in RIFFLES (Avg. %)
Bankhead	East Fork Beech Creek	0%	0%	0%	12%	7%	7%	21%	23%	30%	0%
Bankhead	Indian Creek	5%	0%	1%	54%	27%	7%	6%	0%	0%	0%
Conecuh	Camp Creek	36%	0%	0%	64%	0%	0%	0%	0%	0%	0%
Conecuh	Miller Creek	65%	0%	0%	35%	0%	0%	0%	0%	0%	0%
Oakmulgee	Elliotts Creek	31%	0%	0%	69%	0%	0%	0%	0%	0%	0%
Oakmulgee	Little Oakmulgee Creek	12%	0%	0%	57%	17%	14%	0%	0%	0%	0%
Shoal Creek	Little Shoal Creek	4%	1%	1%	19%	30%	44%	1%	0%	0%	0%
Shoal Creek	Trib to SF Terrapin Cr	0%	0%	2%	3%	12%	15%	41%	18%	11%	3%
Talladega	Garing Creek	0%	0%	1%	7%	16%	37%	9%	13%	19%	1%

Table 7. Fish species and total individual count (adult and young-of-year).

Species		Bank-head		Con-ecuh		Oak-mulgee		Shoal Creek		Talla-dega
		E Fk Beech Cr	Indian Cr	Camp Cr	Miller Cr	Elliotts Cr	Little Oakmulgee Cr	Little Shoal Cr	Trib to SF Terrapin Cr	Garing Cr
Aphredoderidae										
Aphredoderus sayanus	Pirate Perch			6	6	1	2			
Catostomidae										
Catostomus commersonii	White Sucker		6							
Erimyzon oblongus	Creek Chubsucker	3				28				1
Hypentelium etowanum	Alabama Hog Sucker	4						10	1	6
Moxostoma erythrurum	Golden Redhorse									1
Moxostoma poecilurum	Blacktail Redhorse	1								
Centrarchidae										
Lepomis auritus	Redbreast Sunfish								12	
Lepomis cyanellus	Green Sunfish	1	9	1					14	1
Lepomis gulosus	Warmouth		1			1	2	16		
Lepomis macrochirus	Bluegill							26	4	
Lepomis megalotis	Longear Sunfish	5					1	30	4	6
Lepomis miniatus	Redspotted Sunfish			5	3	4	1			
Micropterus coosae	Redeye Bass	3						7	6	34
Micropterus salmoides	Largemouth Bass							1		
Cottidae										
Cottus carolinae	Banded Sculpin		1					7	30	
Cyprinidae										
Campostoma oligolepis	Largescale Stoneroller	17	7					35	26	32
Cyprinella callistia	Alabama Shiner							10		
Cyprinella trichroistia	Tricolor Shiner							65	3	22
Cyprinella venusta	Blacktail Shiner			6						
Hemitremia flammea	Flame Chub		32							
Luxilus chrysocephalus	Striped Shiner	100	5			44	6			
Lythrurus atrapiculus	Blacktip Shiner			17						
Nocomis leptocephalus	Bluehead Chub	9				2	6			
Notemigonus crysoleucas	Golden Shiner		1							
Notropis baileyi	Rough Shiner					66	94			
Notropis chrosomus	Rainbow Shiner							11	9	
Notropis stilbius	Silverstripe Shiner	1						32	20	
Notropis texanus	Weed Shiner			8		11				
Notropis xaenocephalus	Coosa Shiner							16	4	84
Pimephales notatus	Bluntnose Minnow		1							

Table 7 continued.

Species		Bankhead		Conecuh		Oakmulgee		Shoal Creek		Talladega
		E Fk Beech Cr	Indian Cr	Camp Cr	Miller Cr	Elliotts Cr	Little Oakmulgee Cr	Little Shoal Cr	Trib to SF Terrapin Cr	Garing Cr
Cyprinidae										
Pteronotropis hypselopterus	Sailfin Shiner			61	57					
Pteronotropis signipinnis	Flagfin Shiner			12	80					
Rhinichthys atratulus	Blacknose Dace		5							
Semotilus atromaculatus	Creek Chub	25	46					3	70	106
Semotilus thoreauianus	Dixie Chub					1	1			
Esocidae										
Esox americanus	Redfin Pickerel			6	14	7	5			
Esox niger	Chain Pickerel					1	1			
Fundulidae										
Fundulus olivaceus	Blackspotted Topminnow	4		6		11				
Fundulus stellifer	Southern Studfish							4		
Ictaluridae										
Ameiurus natalis	Yellow Bullhead	1				2		4	3	
Noturus funebris	Black Madtom				4	15	3		1	
Noturus leptacanthus	Speckled Madtom			4	1	6	5		1	
Percidae										
Etheostoma artesiae	Redspot Darter	40								
Etheostoma chlorosomum	Bluntnose Darter					14				
Etheostoma colorosum	Coastal Darter			14	2					
Etheostoma coosae	Coosa Darter							8	7	
Etheostoma douglasi	Tuskaloosa Darter	6								
Etheostoma duryi	Blackside Snubnose Darter		7							
Etheostoma edwini	Brown Darter				1					
Etheostoma jordani	Greenbreast Darter							3		
Etheostoma kennicotti	Stripetail Darter		6							
Etheostoma nigripinne	Blackfin Darter		3							
Etheostoma ramseyi	Alabama Darter						5			
Etheostoma stigmaeum	Speckled Darter	7				12	2			
Etheostoma swaini	Gulf Darter					17				
Percina kathae	Mobile Logperch	1						1	5	
Percina nigrofasciata	Blackbanded Darter	18		9	13	14	3	6	9	
Percina palmaris	Bronze Darter								1	
Percina maculata	Blackside Darter	1								
Petromyzontidae										
Lampetra spp.	Lamprey sp.				3	10	25			

Table 8. Index of biotic integrity (IBI) scores (see Table 5 in Appendix A for narrative score descriptions).

District	Stream	IBI Score	IBI Narrative Score
Bankhead	East Fork Beech Creek	46	Good
Bankhead	Indian Creek	42	Good
Conecuh	Camp Creek	48	Good
Conecuh	Miller Creek	46	Good
Oakmulgee	Elliotts Creek	44	Good
Oakmulgee	Little Oakmulgee Creek	46	Good
Shoal Creek	Little Shoal Creek	50	Good
Shoal Creek	Trib to SF Terrapin Cr	44	Good
Talladega	Garing Creek	36	Fair